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AUTHOR Leuba, Richard J.
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ABSTRACT

The relationship between individualized instruction (II) and letter grades is an issue of considerable debate. Ultimately, II and the letter grade system are incompatible. Grading has been a traditional form for ranking or comparing students with respect to performance criteria. The scale typically has been A to F, whereas with individualized instruction grades are usually either A or B. Because II does not rank its students, grades are not "grades" in the traditional sense, but rather are rewards for successfully completing a learning experience. Alternatives for grading II have limitations and disadvantages similar to traditional grading practices. Therefore, it may be best to deemphasize grades in individualized instruction. To do without grades entirely, however, could lead to some student learning and motivation problems. Because the credentialling function is important in higher education, substitute procedures for that function must be developed if traditional grading practices are eliminated. Such procedures must include frequent and rapid feedback mechanisms for the student. A good case can be made for reducing the frequent and rapid feedback mechanisms for the student. A good case can be made for reducing the frequency of grading in the classroom, and in its place establishing a testing service that would occasionally examine, rank, and report on the academic ability of undergraduates. The concept is particularly suited to II, as both the testing service and II would focus upon specific instructional objectives. (DC)

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INDIVIDUALIZED INSTRUCTION AND THE LETTER GRADE SYSTEM*

by Richard J. Leuba
Division of University Studies
North Carolina State University

Introduction

This paper explores the interface between individualized instruction (II) and letter grades, and then proceeds to the arena of grading reform. It will be seen that II and the letter grade system are ultimately incompatible. Further, it is suggested that the credentialling function of grades is inappropriate. Implications of university-wide II are briefly discussed.

By way of definition, II a) is self-paced, b) keeps company both with the reinforcement theory of learning and with instructional objectives, and c) embraces mastery principles. This means that instructors are explicit and detailed as to what students are expected to be able to do as a result of instruction, and students are freer to pursue their studies at times convenient to themselves. Relative to a typical course, instructional materials are more abundant and varied, while lectures frequently aim for motivation rather than transmitting information. A key goal is mastery of subject to a high level of competence by the majority of students. Details on II, its components, variants, and problems, may be found in the literature.[1-9]

GRADING IS RANKING

Literally speaking, academic grading is ranking. To grade is to place in rank order on a value scale, as in the grading of lumber or of eggs. Students are graded by ranking them from A to F. Grading compares student against student with respect

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to a performance criterion.[10]

In the course of time, however, grades assume an aura of objectivity, significant to II. As the same course, with the same (or similar) problems and tests, is given repeatedly, there develop accepted cut-off levels which identify A's, B's, C's, etc. For any particular class, the instructor need not "curve" the grades but may assign grades on the basis of his historically derived cutoffs, or standards. That is, in spite of their origins in a ranking process comparing real people, academic standards come to be defined in terms of specified scores on well-worn tests (see ref. 11 p. 23). Thus, the grading system establishes achievement standards. These standards are important to II because II refers to these standards for the measures of what constitute A, B, C, D, and F.

"Grades" for II

In practice, II "grades" come in essentially two denominations, A and B. (For examples, see references 5, 8, 9, 12.) Because II does not rank its students, these "grades" are not true grades. More precisely, they are rewards. None pretend that all students earning an II A reward are of the same rank. While some sail easily over the hurdles, others struggle barely to succeed.

The II "grade" reward is an incentive to students over the full range of academic ability. In traditional teaching, even with objective standards, there exist no mechanisms for top-grade achievement by less able students, but in II there are remedial loops, coaching, and test re-take opportunities. With appropriate instructional materials, nearly all students have a clear path (i.e. many paths) to a top grade. For middle-rank students, especially, this converts the inaccessible A into a flashing incentive. Not a true grade, the II A is a reward with a strong motivational tug.

Subversion

II "grades" and conventional grading are contemporary, and herein lie inter-

esting and complicating consequences. A few students receive II A's and B's based on mastery achievement, while most students, in traditionally taught courses, receive the gamut of grades, A through F. Since II is the fledgling, even its high grades hardly undercut the grading monolith. However, slight as the effect may be on individual and institutional gradepoint averages, the grading practice of II is clearly subversive.

In sum:-- II employs the achievement standards of the conventional grading system, it simply makes rewards out of top grades, and ironically it subverts the very system upon which it depends, in part, for student motivation.

The Grading Dispute[11, 13-18]

It is an understatement to observe that the conventional grading system is a perennial bed of contention. Those favoring the system argue that grades are a needed measure of learning, the GPA is a convenient and necessary shorthand, the GPA is compared and interpreted more uniformly than are 'evaluations,' grades satisfy a reporting function to the institution and to society, graduate schools and employers need grades for selection, grades keep students on their toes, and grades ensure that instructors will design substantial content into their courses.

Those critical of grades maintain that grades are a rough measure at best and tend to reflect only easily measured learnings, sensible hiring and admissions looks at multi-dimensional profiles rather than at grades alone, grades interfere with and distort teaching and learning, grades have been shown to correlate poorly with career success, literal grading to several decimal places is dehumanizing, grades are students' focus of attention creating unhealthy competition and inviting cheating, and grades are demotivating for less-able students who are forced repeatedly into an academic race with peers of superior endowment.

This author believes that the criticisms are sufficiently validated and significant to warrant a serious attempt at corrective action.

Pressure to Rank II Students

The ongoing dispute over grades is a reminder of a vast unresolved cancer in the educational system and calls for reappraisals and new ideas. First, the question: is the problem not in grading per se, but in the instructional methodology itself? Can the lecture system be replaced with, say, II, and can we grade II students in the literal sense of grading? What is the variable in the II method which can be measured and graded? Evidently, with self-pacing, the variable is time.[19] Some students finish ahead of others. But, were time to be measured and graded, the self-pacing virtue would be lost. Grading a student's time to achieve mastery contradicts a basic tenet of II. Employers and graduate schools, however, find II's pseudo-grades meaningless. "Tell us which students finished first," they'll say, "and don't trouble us with the plodders." Pressure to rank students does not go away.[20] Suppose, then, II retains the mastery concept, but in the interest of measuring and grading time-to-achieve-mastery, it scuttles self-pacing. What then?

Time Grading

Consider this scenario: the traditional GPA is replaced by "timepoint average," the "TPA." The figure of merit is the number of years to complete college, the lower the figure the better. This principle says that 3.1 years is better than 3.2 years, and so forth. Inevitably, with merit so computed, there will arise a legitimate need for compensating adjustments. Compensating credit would be given for a part-time job. An elaborate schedule of negative credits would inevitably develop, covering part-time work, illness, travel, and perhaps even commute time. Thus, for a hypothetical example, a college degree in 50 months (4.17 years) would be adjusted, say, -0.72 years for concurrent part-time work, -0.125 years for a semester off for travel, -0.09 years for an appendectomy, giving altogether an "adjusted" figure-of-merit of 3.235 years, net. And, obviously, my

adjusted net of 3.235 years ranks superior to someone else's adjusted net of 3.25 years! As long as emphasis is placed on grading in the literal sense, no matter what the system of instruction, elaborate procedures are bound to build up around the grading edifice. It is no less ludicrous to identify individual worth in terms of a number to two decimal places, whether by the gradepoint average or through a mastery system and a timepoint average.

II Incompatible With Grading

It is clear from the foregoing that grading of students' abilities on a time-to-completion basis contradicts not only the self-pacing virtue, but it replaces one system of ranking by another with all of the attendant paraphernalia and circumvention associated with the GPA. It is this author's intuitive conclusion that the root of the dispute over grading is not instructional methodology but rather the ranking process itself;-- and with respect to II, I find that II cannot be rationalized with traditional grades, the GPA, nor even with a logical counterpart, the TPA.

II and Motivation

Glancing ahead, it is a platitude to observe that were II to make a substantial penetration into higher education, the resulting preponderance of top grades would ultimately collapse the grading system. Whether this happens, of course, is conjecture, but an end to traditional grading is the logical consequence of widespread adoption of II. Obviously, top marks for II achievers would lose appeal because everybody would get them. What then would motivate students?

One finds in the literature student testimony favorable to the II method of learning,[3, 8] but is it the <u>method</u> which motivates them;-- or are students attracted by the genuine opportunity to rise above the C-ranks? One suspects some of both, but it is difficult to know because the grade rewards obscure any study one might make of the presumed intrinsic motivational qualities of the II method itself.[21]

In II, grade rewards are likely motivators; in traditional teaching, grades motivate to the extent of keeping students proceeding in the traces, even if at less than full-throttle.[22] But in the absense of grades, we should be prepared as instructors to cope with a partial, motivational, void.[23] Ideally, students are motivated and inspired by teachers, but we fall back on grades as a convenient crutch (or club!) and do not always live up to the ideal. Therefore, the time could come when II, sans grade rewards, will have to be re-thought-out in terms of motivation.

Let us turn now to credentials, an aspect of grading wherein II has a useful and important contribution to make in settling some of the dust.

CREDENTIALS AND CREDENTIALLING

II certifies accomplishment, but this is not the same as a conventional credential. The usual college degree is obtained under competitive, graded, academic conditions, and it suggests a level of performance relative to other students. With few exceptions, the degree and the GPA, together, tell something about a new graduate's relative intelligence, general knowledge, learning rate, and ability to perform under pressure. On the other hand, the usual II certificate is obtained in less competitive circumstances, and while it says something about a particular capability, it is usually silent on such attributes as learning speed and ability to perform under pressure (but see 24).

Credentials are necessary. Examples of credentials are a professional engineering registration, a masters degree, a B.S. in electrical engineering, and professional honors. The credential is a useful, although not undisputed, symbol of achievement and ability. What an extended dossier says, a credential says in a four-letter word, "BSEE." In an industrialized and mobile society, there is no substitute for credentialling. Achievements and abilities are authenticated by agencies

outside the person himself and indicate a level and quality of performance which can be expected. While a single credential is not the whole, it contributes to the mosaic, or profile, of a person's capacities and promise. Granted that credentialling in practice is less than perfect, it is assumed for the present discussion that credentials are, on balance, beneficial.

Undergraduate Credentialling

Undefined and unnoticed as such, primordial forms of credentialling occur from the moment a college freshman draws his first breath. Academic credentials are constructed from credits and qualified by grades. Although graduation is recognized widely as a starting-point credential, the process of credentialling actually starts long before. Enroute to graduation, Joe College is credentialled B minus in Calculus, C in Physics, A in Engineering Materials, and so forth. Relative standing, i.e. credentialling, is determined, communicated, and recorded, for each course. Not merely this. Credentialling occurs during the semester as well. My 77 on a quiz establishes where I am relative to the top, the bottom, and the average. Every time an instructor formalizes a comparison among students, he is performing a credentialling function.

Frequency of Credentialling

In professional life, one updates one's credentials occasionally, but in academe the process is incessant. The universal undergraduate credential is the grade-point average (GPA). After two or three years, a student's average is so heavily loaded with grades from his earlier courses that arithmetical inertia makes it improbable that the student could influence his GPA more than a few decimal points. In spite of this, several times a semester, in every course, the system grinds out the detail credential telling how able the student is relative to his peers. It is a though the institution were afraid a prospective employer might call and must be able instantly to consult the gradebook and precisely characterize the academic

standing of a first-semester junior. I believe there is substance to the view that perpetual reminders of mediocrity are demotivating to the vast middle rank of students.[11, 15, 17]

Grades serve other purposes, but in terms only of their credentialling function, it seems that grading frequency is excessive. Asserted adverse effects of grades, especially demotivation, demoralization, and deflection of essential purpose are good reasons to question the practice of perpetual credentialling. One's credential, unlike bank interest, need not be compounded daily.

Feedback and II

Were credentialling to occur only occasionally, there would be a serious classroom feedback lag. As will be discussed later, a student may learn how he ranks with other students occasionally, but the dynamics of learning demand feedback in a much shorter time frame.[5] The instructor may give lectures, show films, assign readings and problems, require laboratory reports, and so forth. He may provide auto-tutorial learning packages, but whatever the instructor does, he needs to know the students' learning progress, and, obviously students wish to know, too. Among the feedback signals available in conventional teaching is the grade.[25] Since grades serve both a credentialling and a feedback function and since credentialling is of little import --in fact a hindrance I submit-- to most teaching, we cannot terminate grading without substituting another feedback mechanism having a short time frame.

One possible educational strategy with a feedback system is II. With frequent readiness, or formative, testing, teachers and students receive timely feedback on how well the process is succeeding. The student knows when he has mastered the material, and if not why, and the instructor receives insights into the strengths and weaknesses of his teaching program. II provides necessary and frequent short-term feedback and does so without the adverse effects associated with over-credentialling.

Occasional, External Credentialling;-- and II

Beyond having a sense of self-worth in an absolute sense, a person should know how his abilities compare with the abilities of others, i.e. with norms. This is realism, an aspect of mental health. Therefore, although students need not be credentialled, i.e. graded, daily, there should be ranking of undergraduates on an occasional basis. And, although a drastic reduction in grading frequency in the classroom is one route to occasional credentialling, the question I would like to raise is: Does it make sense for instructors to concentrate only on teaching, leaving the credentialling function entirely to others?[26] Yes, and one need not look far to find examples. One is the refresher course for engineers preparing for a state license examination; the course instructor delivers the learning, and the state does the credentialling. Other examples of occasional external credentialling include civil service and graduate school entrance exams. A limitation common to these examples is that all are either late-college or post-graduate.

What is called for is a testing service in the university, preferably separate from the teaching departments, which would occasionally examine, rank, and report on the academic ability of undergraduates. One immediately envisions stiff resistance from instructors who believe that only they can determine the progress of their students. One would expect resistance from instructors who do not regularly write instructional objectives explicitly stating what their students are expected to be able to do. On the other hand, were II to prevail, and were instructional objectives prepared for, and used, in all courses, a professional testing service could examine students on the basis of such objectives. In addition to an on-campus agency, greater use might be made of national testing services and professional societies for generating occasional undergraduate rankings.[27] It is important to be clear here that instructors would administer pre-tests and formative tests as integral elements in a non-ranking mastery learning regimen.[28] The agen-

cy outside the classroom would test occasionally so that from time to time the student might have an update of his norm-referenced standing.

Recapitulating: If II were to prevail, and if, as earlier discussed, the grading system were to topple, and if occasional ranking were deemed useful to students, then, in principle, it appears that instructors could be totally relieved of the credentialling function and could concentrate 100 percent on teaching. Although the author is well aware of the hypothetical "if's" in the foregoing, the scenario is given for the critical illumination it sheds on the present. An aspect of any evaluation of the present is the study of the possible futures to which present trends are directed.[29]

Reporting Students' Progress and Credentials

As stated earlier, to be meaningful a credential compares a student's performance to normative data, that is, to his peers. Suggestions follow for reducing adverse effects of grades by making occasional credentialling "low profile" and less publicized than undergraduate credentialling heretofore. Using evidence collected by agencies external to the classroom, students could periodically review their norm-referenced academic ratings with their academic and career advisors and --when the time came-- distribute such results to prospective employers. (Anonymous summaries of test data would inform faculty, administration and the public on the institution's performance in its mission to educate.) With students' transcripts, the university would make available summaries of required demonstrable achievement for each course which the student mastered. In sum, the informational and administrative functions of grades could be served by occasional credentialling.

CLOSURE

Changes in academe discussed here are not trivial. It is not trivial to re-

place conventional education with II, to separate credentialling from teaching, to undercut --and ultimately topple-- the grading edifice. Such wholesale changes as these should be considered following a much wider analysis of contemporary education. A broad range of questions needs to be asked. Education is a maturation process in which emotional and intellectual development progresses towards internal harmony and integrity, greater capacity to relate, enhanced ability to cope, and more effective specialized ability. Time-honored qualities include judgment, moral strength, imagination, creativeness, memory, capacity to learn, love, self-assessment, and so forth. How well does the present system score on these attributes? Where, besides grading, are there serious system deficiencies? In seeking general improvement one should commence one's inquiry on a level above II and grades.

If in the search for betterment, this paper provides a partial foundation of ideas, it will have served one purpose, and if it expands and clarifies the vision of instructors who must "grade" their II students it will have served its second purpose.

References and Notes

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1. Synonyms and/or variants, subsumed under the generic umbrella of Individualized Instruction, include Individually Prescribed Instruction (IPI), Personalized (or Proctorial) System of Instruction (PSI), and Self-Paced Instruction (SPI).

2. Keller, Fred S. "Good-bye Teacher . . ." Journal of Applied Behavior Analysis N 1 Spring 1968 79-89

3. Kulik, James A., et al., "The Keller Plan in Science Teaching" Science V 183 February 1, 1974 379-383

4. Harrisberger, Lee "Self-paced Individually Prescribed Instruction" Engineering Education V 61 N 6 March 1971 508

5. Block, James H. (ed.) Mastery Learning Holt, Rinehart and Winston, Inc. 1971

6. Mager, Robert F. Preparing Instructional Objectives Fearon 1962

7. Postlethwait, S. N. The Audio-Tutorial Approach to Learning Burgess 1969

8. Cook, Donald A. "Personalized System of Instruction: Potential and Problems" EPIE Report V VII N 61 April 1974 Educational Products Information Exchange Institute, New York

9. Cardozier, V. R. "Problems With Self-Paced Instruction From an Administration Point of View" In-Ed V 1 N 3 March 1974 The University of Texas of the Permian Basin

10. This paper proceeds on the basis of a literal translation of "grading," i.e. ranking. In practice, grades are assigned on a multiplicity of bases depending upon the school, student, instructor, class, year in college, and a host of other factors, most, or all, frequently undefined. See reference 11.

11. Warren, Jonathan R. "College Grading Practices: An Overview" Report 9 ERIC Clearinghouse on Higher Education March 1971

12. Weeks, W. L. and W. H. Hayt, Jr. "Facility for Individualized Instruction in EE" ERM V 6 N 2 December 1973 52-55

13. Leuba, Richard J. "Individually Prescribed Instruction and the Letter Grade System" Annual Conference Am. Soc. for Engineering Education 1974 [Paper from which the present writing is a condensation.]

14. Feldmesser, Robert A. "The Positive Functions of Grades" Educational Record V 53 N 1 Winter 1972 66-72

15. Kirschenbaum, Howard et al. Wad-ja-get? The Grading Game in American Education Hart Publishing Co. 1971

16. Sheleff, Leon "A Credit Accumulation System: An Alternative to GPA and Pass-Fail" Educational Record V 53 N 3 Summer 1972 227-233

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17. Flammer, Gordon "Applied Motivation: A Missing Role in Teaching" Annual Conference Am. Soc. for Engineering Education 1971

18. Forrester, Jay W. "Engineering Education and Practice in the Year 2000" Engineering Education V 60 N 10 June 1970 974-979

19. Flammer, Gordon H. "Learning as the Constant and Time as the Variable" Engineering Education V 61 N 6 March 1971 511-514

20. An objection encountered when seeking approval for an II course at Wichita State University [Smith, Bert L. and Robert S. Goudy, "An Experiment in Individually Prescribed Instruction," ERM V5 N1 (October 1972) 14-16] was that if all students made high grades, industry would not be able to differentiate one from another, to which the authors replied: Their business was teaching engineering dynamics, not sorting out students for prospective employers!

21. One writing in which motivation is ascribed to the immediate feedback feature of the self-paced method is Cook (reference 8) p 4.

22. This author's intuitive conclusion after eight years of college teaching, but see also Flammer, reference 17.

23. Warren, Jonathan R. op.cit. p 13-14.

24. If II students cannot perform in a limited time, then there is reason to refashion or augment the instructional objectives to include time discipline. There is no reason why an objective cannot specify speed of accomplishment nor why II cannot teach students to think fast and solve problems quickly.

25. The grade as a feedback signal: In one sense, feedback in the learning loop is a score, such as on a quiz, and evaluative comment, such as on a term paper, but either explicitly or unconsciously, these forms of raw evaluation are inevitably translated into their corresponding grades. Hence my designation of the grade as a feedback signal. See also, Warren, reference 11, p 3.

26. A similar question is raised by Warren, reference 11, pp 3, 23.

27. A careful study by Peter K. Gessner [SCIENCE V180 566-570 (11 May 1973)] of sophomore medical students shows a high positive correlation between student ratings of instruction and performance on national normative examinations. The author suggests that the latter may be a valid measure of teaching effectiveness (at least, presumably, for the conditions of his study). Warren W. Willingham, Executive Director for Program Research, Educational Testing Service, reports [SCIENCE V 183, 273-278, (25 January 1974)] the relatively stronger position of the Graduate Record Exam over GPA as a predictor of success in graduate school, including for engineering and applied science.

28. For an imaginative essay on testing, humane and otherwise, see Kohn, Harold W. "Non-Destructive Testing" Journal of General Education V24 N3 (October 1972) 176-8. Pennsylvania State University Press.

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29. Evidences of the growing II trend include The Personalized System Of Instruction NEWSLETTER, Center for Personalized Instruction, Georgetown University, in its second year of publication, and ONE-TO-ONE, Newsletter of the International Audio-Tutorial Congress, Berkeley-Charleston-Dorchester Technical Education Center, 7000 Rivers Ave., North Charleston, South Carolina 29405, also in its second year (but there have been five annual conferences of the Congress). See also Cook, reference 8.

30. The author acknowledges the many helpful suggestions from H. M. Eckerlin, T. H. Glisson, C. L. Heimbach, and J. B. O'Neal, Jr.